DOCUMENT RESUME

ED 479 727 CE 085 383

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TITLE	Ohio Construction Technologies Competency Profile.
INSTITUTION	Ohio State Univ., Columbus. Center on Education and Training for Employment.; Ohio Board of Regents, Columbus.; Ohio State Dept. of Education, Columbus.
SPONS AGENCY	Ohio State Dept. of Education, Columbus. Div. of Career-Technical and Adult Education.
PUB DATE	2002-00-00
NOTE	90p.
CONTRACT	GRF-200-545
AVAILABLE FROM	For full text: http://www.ohtpcs.org/cp/construction.asp.
PUB TYPE	Guides - Non-Classroom (055)
EDRS PRICE	EDRS Price MF01/PC04 Plus Postage.
DESCRIPTORS	Apprenticeships; Associate Degrees; *Building Trades; *Competency Based Education; Construction (Process); *Construction Management; Construction Materials; Education Work Relationship; *Employment Qualifications; Job Skills; Minimum Competencies; Occupational Clusters; Postsecondary Education; Secondary Education; Skilled Occupations; State Standards; Statewide Planning; *Tech Prep; Technical Occupations; *Vocational Education
IDENTIFIERS	Building Codes; Career and Technical Education; *Ohio; Surveying (Construction)

ABSTRACT

This document, which lists construction technologies competencies as identified by representatives from government agencies and labor organizations as well as secondary and postsecondary educators throughout Ohio, is intended to assist individuals and organizations in developing both college tech prep programs and apprenticeship training/education programs that will prepare students from secondary through post-secondary associate degree programs for employment in these three occupational cluster areas: apprenticeship, design-build, and construction management. Each of the cluster areas contain essential competencies common to each of the occupations within the cluster and competencies specific to an occupation. The competencies, which are separated into essential competencies needed to ensure a minimal level of employability and recommended competencies, are organized by instructional units and include suggestions as to when students should be introduced to and proficient at them. Sample topics include management; codes; materials; construction processes; estimating; skills development; civil surveying and communication. Appendices include a list of technical competency profile (TCP) panel members and a pathway template. (MO)

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ED 479 727

OHIO
CONSTRUCTION TECHNOLOGIES
COMPETENCY PROFILE

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Fall 2002

This project is supported in whole by the Ohio General Revenue Fund (GRF) 200-545, Vocational Education Enhancements, distributed by the Ohio Department of Education, Office of Career-Technical and Adult Education

This project is a collaborative effort of the Ohio Department of Education, Ohio Board of Regents, and The Ohio State University, Center on Education and Training for Employment

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INTRODUCTION

The Ohio Construction Technologies Competency Profile was collaboratively developed by the Ohio Board of Regents and the Department of Education, Career-Technical and Adult Education, and the Center on Education and Training for Employment at The Ohio State University. The profile provides a framework for a broad-based educational response to curricula for construction technologies. The need for broader array of construction professionals developed due to the shortage of skilled and management people in the trade areas, shortage of design technicians, the challenges of an urbanized world and the attraction of an urban life.

The profile includes essential competencies that are grounded in construction technology secondary through post secondary studies. The profile also recognizes the value of apprenticeship education/training as an equivalent to post secondary studies. The profile is further delineated by three occupational cluster areas: apprentice able construction areas, design-build, and construction management. Each of the cluster areas contains essential competencies common to each of the occupations within the cluster and competencies specific to an occupation. This profile design reflects programming flexibility that represents many options for educational studies and career planning.

Representatives from a broad spectrum of Ohio's professionals played a critical role in defining the vision and scope of construction technologies and in defining the essential skills for current and future employees. Secondary and post-secondary educators representing Ohio schools and colleges identified essential competencies with proficiency standards met by the attainment of the Associate Degree. Representatives from the Ohio Bureau of Apprenticeship Training, various government agencies and labor organizations provided leadership in identifying the apprenticeship competencies. Ohio's Academic Standards are referenced to reflect higher academic course work in preparation for continued educational studies. (A list of business/ industry representatives and educators participating in the development of the profile appears in the appendices.)

The Construction Technologies Competency Profile will be used as the basis for the development of an integrated delivery system that provides opportunities for new and challenging programs and courses. Career-Technical Education, College Tech Prep, post secondary degree programs, and apprenticeships will be enhanced and expanded through the use of the Construction Technologies curriculum. Samples of delivery models are referenced to guide all stakeholders in collaborative development of programs.

This profile is available on the Internet at: **www.ohtpcs.org**. At this location users can download copies of the entire profile or conduct searches on a number of key variables.

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ACKNOWLEDGEMENTS

The Construction Technologies Competency Profile is a project of the Ohio Board of Regents and the Ohio Department of Education. In addition to the professionals and educators listed in the Appendix, a number of individuals contributed their time and expertise to this initiative. Special thanks are due to Jonathan L. Tafel, Vice-Chancellor for Educational Linkages and Access, Ohio Board of Regents; Vicki Melvin, Director, Career-Technical and Adult Education, Ohio Department of Education; Julie Novel and Linnae Clinton, Tech Prep Project Manager/ Consultants, Career-Technical and Adult Education, Ohio Department of Education; Bob Bowermeister, Assistant Director, Industrial and Engineering Systems, Career-Technical and Adult Education, Ohio Department of Education; Richard Wancho, Consultant, Industrial and Engineering Systems, Career-Technical and Adult Education, Ohio Department of Education; Richard Arndt, Director K-16 Initiatives, Ohio Board of Regents; and Nicholas Wilson, Assistant Director K-16 Initiatives, Ohio Board of Regents. Their vision, support, and encouragement made this project possible.

Thanks are also due to the following:

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COLLEGE TECH PREP

College Tech Prep is a high school and college career path linked to business, industry, and labor that insures a specified seamless pathway from high school to college to careers, meeting Ohio's technological employment needs.

A College Tech Prep student is enrolled in a state approved Tech Prep education program. A College Tech Prep Program means a program of study that:

- Combines, at a minimum, two years of secondary education (as determined by Ohio definitions) with a minimum of two years of post-secondary education in a non-duplicative, sequential course of study.
- Integrates academic and technical instruction and utilizes work-based and work-site learning, where appropriate and available.
- Provides technical preparation in a career field such as engineering technology; applied science; mechanical, industrial or practical art or trade; agriculture; health occupations; business; or applied economics.
- Builds student competencies in mathematics, science, reading, writing, communications, economics, and workplace skills through applied, contextual academics and integrated instruction, in a coherent sequence of courses.
- Leads to an associate or baccalaureate degree, or a BAT (Bureau of Apprenticeship Training) apprenticeship requiring a minimum of two years in a specific career field.
- Leads to placement in appropriate employment or to further education.

Construction Technologies Cluster Tech Prep Program
General Characteristics

Program is designed to

- provide a broad survey of multiple construction technology fields at the secondary level,
- introduce common elements of construction technologies at the secondary level, and reinforce throughout secondary and post-secondary and/or apprenticeship levels,
- introduce technical competencies in at least one construction technology cluster at the secondary level,
- prepare the student for advanced studies in a specific construction technology field at the post-secondary level,
- prepare the student for studies and training in a specific construction apprenticeship program, and
- reinforce common elements and introduce more advanced skills in a construction management field at the post-secondary level.

Curriculum includes academic coursework in language arts, mathematics, sciences, social studies, foreign language, and technology taught to contextually coincide with a construction technology framework.

Curriculum is delivered using integrated, contextual, hands-on methodology. Curriculum is enhanced by work-based learning, industry-based standards and credentials, program accreditation, and teacher credentials, and should include:

- student internships
- job shadowing
- mentorships
- industry field trips
- industry guest speakers in classroom
- college lab experiences
- "constructivist" contest/competition opportunities
- industry project work
- apprenticeship
- a 12th grade capstone project

Curriculum is supported and validated, and may be supplemented by industry-relevant standards.

Instructors in the Construction Technologies Tech Prep program will engage in relevant continuing professional development and curriculum enhancement including:

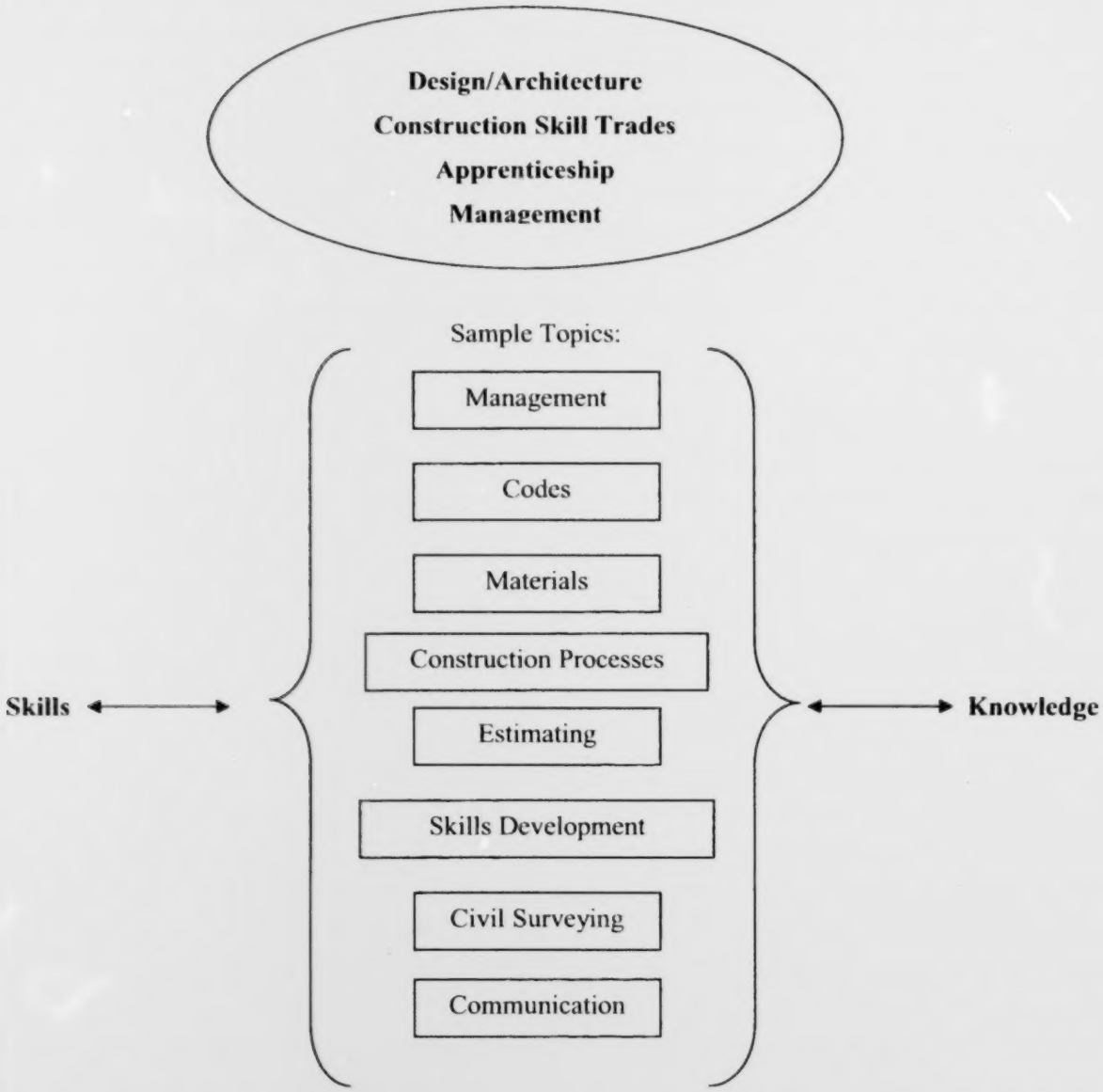
- industry job shadowing
- industry externships
- active industrial advisory committee involvement

High school math courses (algebra, geometry, trigonometry, precalculus), the physical sciences (chemistry, physics, and earth systems), communic ations (English, reading, writing), work ethics, professionalism and career planning, and basic computer applications are a part of the

entire Tech Prep Construction Technologies program curriculum, as referenced in academic and career planning/counseling content for program

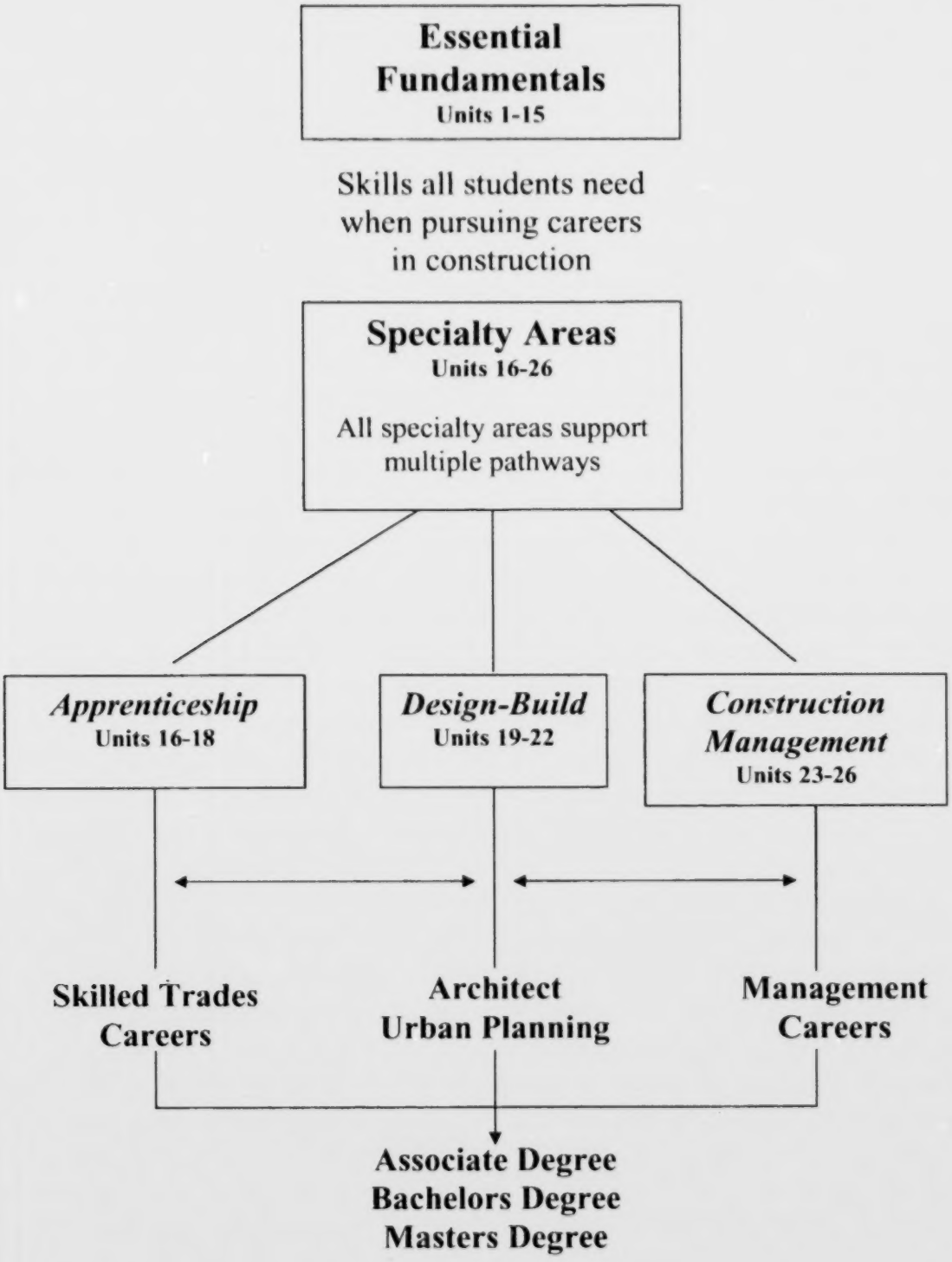
The objective of clustering the construction technology fields for the Tech Prep program implementation is to provide a structured approach for student exposure to multiple disciplines. Major fields of the construction technology profession, as well as common designations for apprenticeships are grouped into clusters of similarity. The construction technology profession crosses many industries. The curriculum needs to be supported by contextual references and examples across industries.

CONSTRUCTION TECHNOLOGIES COMPETENCY PROGRAM



Student achievement increases when knowledge and skills are intertwined. The graphic represents the flow of knowledge and skills throughout all areas of study. The continual flow between skills and knowledge lend rigor and relevance to Tech Prep studies.

Construction Technologies Program



KEY TO PROFILE CODES

IMPORTANCE OF COMPETENCIES

All of the competencies in this document represent the minimum requirements for a College Tech Prep construction technologies program. It is the responsibility of the local consortia to further define and/or expand the key indicators for each competency, as needed. Each competency will be taught at either the introductory or proficiency level by the completion of the Tech Prep program, which is the minimum of an Associate Degree or registered Apprenticeship program.

The intent of this document is to integrate high academics with skill acquisition. Technical skills are a required component. However, the degree of skill acquisition may vary based on the educational setting.

I = **Introduce** (Learner will demonstrate knowledge and comprehension of the competency.)

P = **Proficient** (Learner will demonstrate ability to apply knowledge of and/or perform the competency.)

Grade Level: **12** = by the end of grade 12
AD = by the end of the Associate Degree
ApT = by the end of the Apprenticeship Program

All essential competencies have been assigned a P (Proficient) by end of the Associate Degree. [There may be instances where both Introduce and Proficient are at either the 12th grade, the Associate Degree or Apprenticeship Program.]

ACADEMIC CONNECTION (AC)

All Tech Prep programs are responsible for meeting the academic content standards.

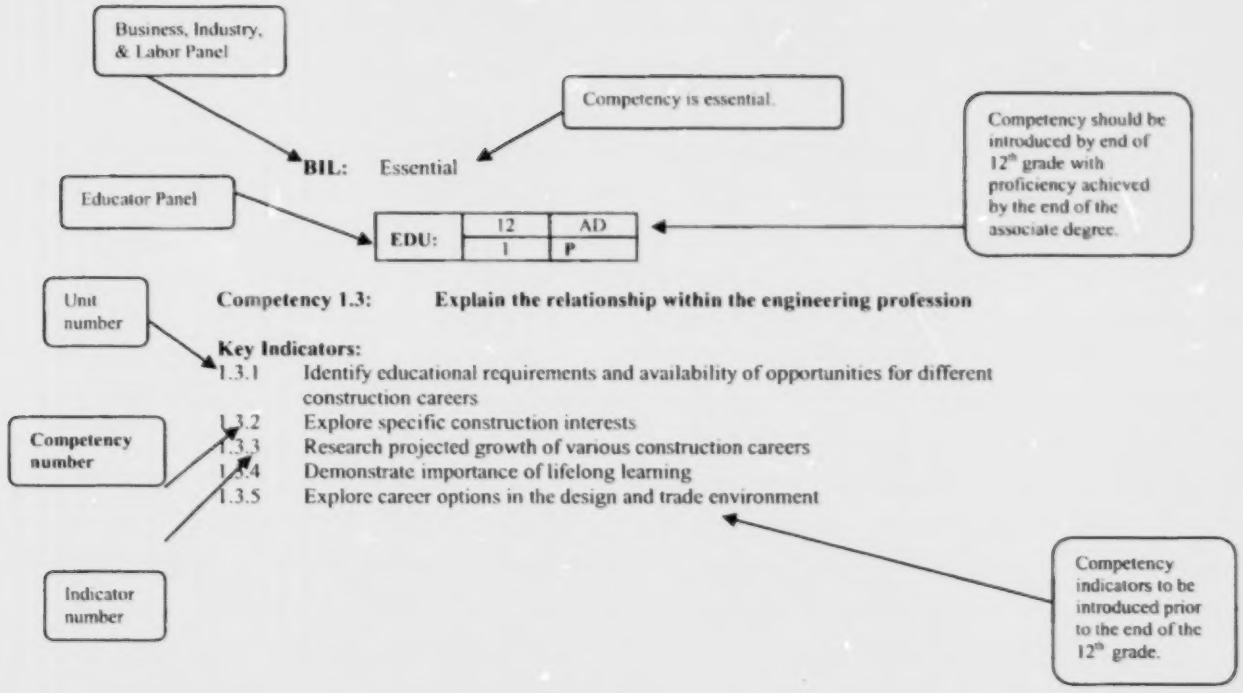
Example:

BIL: Essential

	12	AD	ApT
EDU:	I,P	P	**P**

Competency 1.1: Analyze . . . .
Key Competency Indicators:
Explain . . . .
Identify . . . .

EXAMPLE:


Business, Industry, & Labor Panel
Competency is essential.
Competency should be introduced by end of 12th grade with proficiency achieved by the end of the associate degree.
BIL: Essential
Educator Panel
EDU:
12
AD
1
P
Unit number
Competency 1.3: Explain the relationship within the engineering profession
Key Indicators:
1.3.1 Identify educational requirements and availability of opportunities for different construction careers
1.3.2 Explore specific construction interests
1.3.3 Research projected growth of various construction careers
1.3.4 Demonstrate importance of lifelong learning
1.3.5 Explore career options in the design and trade environment
Competency number
Indicator number
Competency indicators to be introduced prior to the end of the 12th grade.

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Construction Technologies Program Sample Delivery Models

Example 1:

Grades 11-14:	Units 1-15 – Secondary through Post-secondary Studies
Secondary:	Apprenticeship Cluster – Essential Cluster Competencies plus Focus on one of the Construction Applications Cluster specialty areas (i.e., electrical), Survey additional programs available with apprenticeships and/or post-secondary institutions within local Consortium, and 12th grade capstone project (results in one specialty area and an apprenticeship)
Post-secondary:	Specialization in chosen Construction Technology program
or	
Apprenticeship:	Specialization in chosen Construction Apprenticeship program

Example 2:

Grade 11-14:	Units 1-15 – Secondary through Post-secondary Studies
Secondary:	Unit 16 Apprenticeship Cluster – Essential Cluster Competencies plus Focus on two or more Construction Applications Cluster specialty areas (i.e., Electrical, Carpentry, HVAC), Survey additional programs available at postsecondary institutions within local Consortium, and 12th grade capstone project (results primarily in exposure of entire class to multiple apprenticeships)
Post-secondary:	Specialization in chosen Construction Technology program
or	
Apprenticeship:	Specialization in chosen Construction Apprenticeship program

Example 3:

Grade 11-14:	Units 1-15 – Secondary through Post-secondary Studies
Secondary:	Unit 17 Construction Essential Cluster Competencies plus Focus on one Construction Applications specialty area (i.e., Electrical) Survey additional programs available at postsecondary institutions within local Consortium, and 12th grade capstone project (results primarily in exposure of entire class to a single cluster)
Post-secondary:	Specialization in chosen Construction Technology program
or	
Apprenticeship:	Specialization in chosen Construction Apprenticeship program

Construction Technologies Program Example Delivery Models (Continued)

Example 4:

Grade 11-14:	Units 1-15 – Secondary through Post-secondary Studies
Secondary:	Focus on Units 19-22 Design-Build Competencies (results in exposure of entire class to Design-Build specialty areas) Survey additional programs available at postsecondary institutions within local Consortium and 12th grade capstone project
Post-secondary:	Specialization in chosen Construction Technology program

Example 5:

Grade 11-14:	Units 1-15 – Secondary through Post-secondary Studies
Secondary:	Unit 19 Construction Essential Cluster Competencies plus Focus on one Design-Build specialty area (i.e., Architecture, Urban Planning) Survey additional programs available at postsecondary institutions within local Consortium, and 12th grade capstone project (results primarily in exposure of entire class to a single cluster)
Post-secondary:	Specialization in chosen Construction Technology program

Example 6:

Grades 11-14:	Units 1-15 – Secondary through Post-secondary Studies
Secondary:	Survey of all three (3) clusters via team assignment/research, job shadowing/internship, project-based learning, and apprenticeship, and 12th grade capstone project in team's assigned cluster or specialty area (results in exposure of entire class to all clusters – Construction Applications, Design-Build, Construction Management)
Post-secondary:	Specialization in chosen Construction Technology program

Example 7:

Grade 11-14:	Units 1-15 – Secondary through Post-secondary Studies
Secondary:	One specialty area under the Construction Cluster (e.g., Carpentry), and 12th grade capstone project
Post-secondary:	Specialization in chosen Construction Management program

Unit 1: Career Enhancement Skills

BIL: Essential

	12	AD	ApT
EDU:	I,P	P	P

Competency 1.1: **Demonstrate skills that enhance employment opportunities**

Key Indicators:

1.1.1 Exhibit desirable personal and professional attitudes, behaviors, and work habits

1.1.2 Apply the process and documents needed for obtaining a position

1.1.3 Identify new changes in career fields

1.1.4 Develop skills to maintain state-of-the-art competencies

BIL: Essential

	12	AD	ApT
EDU:	I,P	P	P

Competency 1.2: **Interact appropriately and respectfully with diverse groups**

Key Indicators:

1.2.1 Understand the differences associated with diversity and the implications of those differences (e.g., gender, ethnic, age, race, economic, educational, background, public *(urban, suburban, rural, inner city)* vs. private)

1.2.2 Demonstrate appropriate strategies and solutions for dealing with conflicts and differences (i.e., harassment, workplace violence)

1.2.3 Apply competencies for communicating and working with various groups

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 1.3: **Develop career pathways in the construction environment**

Key Indicators:

1.3.1 Identify educational requirements and availability of opportunities for different construction careers

1.3.2 Explore specific construction interests (e.g., shadowing, worksite experiences, professional readings, community service, internships)

1.3.3 Research projected growth of various construction careers

1.3.4 Demonstrate importance of lifelong learning

1.3.5 Explore career options in the design and trade environment

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 1.4: **Recognize requirements for career advancement**

Key Indicators:

1.4.1 Perform quality work as measured by a performance evaluation

1.4.2 Document successful completion of education and training opportunities

1.4.3 Participate in professional development opportunities such as professional organizations and associations, trade shows and seminars

1.4.4 Read trade magazines and journals, manufacturers' catalogues, industry publications and internet sites to keep current on industry trends

1.4.5 Examine the organization and structure of various segments of the industry to prepare for career advancement

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 1.5: **Align licensing, certification and credentialing requirements at the national, state and local levels to achieve compliance**

Key Indicators:

1.5.1 Use technologies and resources to research licensing, certification and credentialing

1.5.2 Evaluate and select suitable sources of licensing, certification and credentialing

1.5.3 Identify licenses, certifications and credentials applicable to career goals

1.5.4 Document sources and agencies for licensing and certification and credentialing information including contact information

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 1.6: **Maintain a record of work experiences, licenses, certifications and education to build a portfolio**

Key Indicators:

1.6.1 Document work experience

1.6.2 Document receipt of licenses, certifications and credentialing

1.6.3 Document completion of education and training

1.6.4 Contact professional references to acquire recommendations

Unit 2: Integrated Academic Foundations

BIL: Essential

	12	AD	ApT
EDU:	I,P	P	P

Competency 2.1: **Demonstrate critical math and measurement skills in construction professions**

Key Indicators:

2.1.1 Measure dimensions, space, and structures in standard and metric units

2.1.2 Explain how to gather and manipulate various math measurements used in the construction industry

2.1.3 Perform math operations to complete tasks in critical work functions of the construction industry

2.1.4 Demonstrate use of level, plumb and square in lay out sites for all types of construction activities

2.1.5 Calculate volumes of shapes and structures and relate the importance to productivity, safety issues, and building use

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 2.2: **Determine and analyze the effects of environmental conditions in various construction applications**

Key Indicators:

2.2.1 Identify physical symptoms of exposure to the appropriate temperature extreme

2.2.2 Identify appropriate actions to remediate the temperature-induced physical symptoms

2.2.3 Demonstrate how to monitor weight and pulse

2.2.4 Examine how to change production practices to accommodate temperature/environmental factors and conditions

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 2.3: **Demonstrate science principles critical to the construction profession**

Key Indicators:

2.3.1 Understand chemical reactions such as how mortar sets and how encapsulants work

2.3.2 Analyze and understand physical principles such as forces, friction, and energy

2.3.3 Differentiate between compatible and incompatible substances such as acids and bases, epoxies, and poisonous gases

2.3.4 Prevent the mixing of incompatible substances

2.3.5 Understand weight and mass and appraise how it relates to rigging, wind, and structure supports

2.3.6 Understand simple and complex machines such as levers, pulleys, and other machines

2.3.7 Recognize basic engineering and architectural principles in structures

2.3.8 Know the types and processes of radiation, its dangers, and ways to control exposure

2.3.9 Understand how soil properties, profile and type affect work

2.3.10 Determine concentrations of substances

2.3.11 Demonstrate knowledge of hazardous properties of materials such as toxicity, flammability, reactivity, corrosivity, and the limits of fire resistance exposure

2.3.12 Understand how to use pressures of liquids and gasses and analyze use of hydraulics and pneumatics

2.3.13 Understand density, viscosity, and mass

2.3.14 Understand and evaluate the characteristics and hazards of electricity

2.3.15 Describe the chemical processes that occur in relation to environmental conditions and construction building materials

2.3.16 Identify the physical properties of different materials such as metals, rock, plastic, and masonry

Unit 3: Materials

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 3.1: **Analyze various materials (e.g., metals, woods, ceramics, concrete, rubber, plastics, polymers, composites, etc)**

Key Indicators:

3.1.1 Describe the structure of various materials
3.1.2 Describe the properties of various materials
3.1.3 Identify examples of various materials

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 3.2: **Demonstrate knowledge of various material finishing techniques**

Key Indicators:

3.2.1 Recognize appropriate applications for finishing techniques
3.2.2 Apply finishing techniques

BIL: Essential

	12	AD	ApT
EDU:	I	P	I,P

Competency 3.3: **Demonstrate knowledge of various material testing techniques (e.g., hardness, tensile strength, compressive strength, ductility, homogeneity, wear resistance, temperature resistance, chemical analysis)**

Key Indicators:

3.3.1 Identify material testing techniques

3.3.2 Recognize appropriate applications for different materials testing techniques

BIL: Essential

	12	AD	ApT
EDU:	I	P	I,P

Competency 3.4: **Perform material selection for various applications**

Key Indicators:

3.4.1 Describe criteria used for material selection (e.g., strength, resistance to wear, resilience, durability, availability, associated costs)

3.4.2 Identify alternative materials

3.4.3 Evaluate alternative materials

3.4.4 Prepare summary of material options

3.4.5 Communicate a summary of material options

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 3.5: **Apply knowledge and uses of basic construction materials**

Key Indicators:

3.5.1 Identify and describe variety of construction materials for which workers may be responsible on site

3.5.2 Identify specific handling and storage characteristics of different materials

3.5.3 Discuss appropriate transport methods of various construction materials

3.5.4 Discuss similarities and differences between materials that are the same general type (e.g., lumber, pipe fittings, types of fasteners, nails, etc.)

3.5.5 Identify incompatible materials

3.5.6 Identify inherent characteristics of different materials (wearability of, maintenance, ease of use, etc.)

3.5.7 Identify fastening or joining applications characteristic to different materials

Unit 4: Estimating

BIL: Essential

	12	AD	ApT
EDU:	I	P	I,P

Competency 4.1: Estimate needed materials and equipment

Key Indicators:

4.1.1 Illustrate use of various formulas for calculating the amount of materials needed to complete a task

4.1.2 Calculate the amount of material needed for given dimensions

4.1.3 Discuss the importance of estimating materials correctly and determine how and when to use estimating skills

4.1.4 Estimate equipment related costs

4.1.5 Consider productivity, demographics, values, results in performance

4.1.6 Explain the concept of profit used in estimations

BIL: Essential

	12	AD	ApT
EDU:	I	P	I

Competency 4.2: Estimate needed labor and costs

Key Indicators:

4.2.1 Demonstrate estimating techniques commonly used on jobs

4.2.2 Calculate time (e.g., charge for labor on a job, project completion, project schedules)

4.2.3 Estimate the cost of labor and overhead based on given set of contract documents

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 4.3: **Analyze the economic impact of various work functions**

Key Indicators:

4.3.1 Identify the factors related to loss of work hours (permits, bonds)
4.3.2 Identify the financial impact related to loss of work hours
4.3.3 Compare costs associated with different construction equipment
4.3.4 Factor the safety costs
4.3.5 Gather costs for permits, bonds, and contractor licensing

BIL: Essential

	12	AD	ApT
EDU:	I	P	I,P

Competency 4.4: **Apply estimating technology**

Key Indicators:

4.4.1 Identify responsibilities of estimator
4.4.2 Compare and contrast estimating techniques (manual vs. software)
4.4.3 Analyze how estimating software practices affect take-off efficiency

Unit 5: Systems

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 5.1: **Identify diverse organizational structures within the construction industry (union, independent, contractors, subcontractors, management, customer, designer, requisitions officials, financial/regulatory side)**

Key Indicators:

5.1.1 Identify various roles and populations within construction organizations

5.1.2 Compare roles and missions of predominant construction organizations

5.1.3 Appraise the impact of interaction of organizations in construction industry

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 5.2: **Analyze the relationship among various construction stakeholders**

Key Indicators:

5.2.1 Identify the roles of construction professionals within a given delivery system (skilled trades, architects/engineers, suppliers, supervision, consultants, regulatory contacts, how to access, and value of specialty)

5.2.2 Define duties/responsibilities of individual professionals within each of the identified professions

5.2.3 Describe the mutual contributions of each stakeholders in different professions

5.2.4 Identify interested parties outside the construction industry and determine how to gain access to them

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 5.3: **Investigate factors that may affect various construction organizational structures**

Key Indicators:

5.3.1 Identify current credentials, certifications, apprenticeships, and standards
5.3.2 Identify historic, current and emerging trends and issues (e.g., economic, technological, demographic, etc.)
5.3.3 Analyze how changes affect the organizational structure of the industry

BIL: Essential

	12	AD	ApT
EDU:	I	I,P	I,P

Competency 5.4: **Differentiate typical construction contract relationships**

Key Indicators:

5.4.1 Investigate direct hire methods and groups involved
5.4.2 Investigate competitive and non-competitive bid methods and groups involved
5.4.3 Investigate design-build methods and groups involved
5.4.4 Investigate design-bid-build methods and groups involved

BIL: Essential

	12	AD	ApT
EDU:	I	I,P	I,P

Competency 5.5: **Comply with governmental regulations and applicable codes**

Key Indicators:

5.5.1 Follow governmental regulations and building codes
5.5.2 Use information given in regulations and codes correctly
5.5.3 Pass job inspections and comply with regulations at all times

BIL: Essential

	12	AD	ApT
EDU:	I	P	I,P

Competency 5.6: **Examine relationship of roles and responsibilities between professions to complete a project/job**

Key Indicators:

5.6.1 Plan, organize, schedule and manage a project/job to optimize workflow sequence
5.6.2 Identify timeline required to complete a project/job
5.6.3 Evaluate efficiency and effectiveness of a project/job
5.6.4 Report results of the project/job

BIL: Essential

	12	AD	ApT
EDU:	I	P	I,P

Competency 5.7: **Recognize the hierarchy of the jobsite to facilitate smooth workflow**

Key Indicators:

5.7.1 Incorporate job functions in the reporting chain of supervision

5.7.2 Evaluate the safety issues and responsibilities managed by each level of supervision

BIL: Essential

	12	AD	ApT
EDU:	I	P	I,P

Competency 5.8: **Align and incorporate the build environment and its systems to complete the project**

Key Indicators:

5.8.1 Label all systems on a set of construction documents

5.8.2 Discuss the interrelationship of the systems in the build environment

5.8.3 Use the concept of "Critical Path Method (CPM)" and/or similar sequential methods so that work progresses efficiently

BIL: Essential

	12	AD	ApT
EDU:	I	P	I,P

Competency 5.9: **Apply industry standards and practices in order to incorporate quality into projects**

Key Indicators:

5.9.1 Document how quality improves profitability

5.9.2 Report on issues that affect quality

5.9.3 Perform work meeting or exceeding the quality standards of the industry

Unit 6: Communication

BIL: Essential

	12	AD	ApT
EDU:	P	P	P

Competency 6.1: **Demonstrate oral and written communication techniques**

Key Indicators:

6.1.1 Practice the appropriate methods of giving and receiving information
6.1.2 Contrast professional and social communications
6.1.3 Identify cultural differences that may affect communication

BIL: Essential

	12	AD	ApT
EDU:	P	P	P

Competency 6.2: **Demonstrate appropriate worksite communication**

Key Indicators:

6.2.1 Demonstrate effective ways to seek clarification from supervisor and co-workers
6.2.2 Confirm understanding of verbal and visual instructions
6.2.3 Ask questions concerning details of instructions
6.2.4 Speak succinctly and clearly to convey information
6.2.5 Comprehend terminology spoken on a construction site
6.2.6 Demonstrate knowledge of slang and jargon related to the different trades

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 6.3: **Demonstrate proper use of American National Standards (ANSI) hand signals to communicate with other workers**

Key Indicators:

6.3.1 Identify the correct signal to direct the load
6.3.2 Use the correct signal to direct the load
6.3.3 Demonstrate how to work out signal use with the equipment operator
6.3.4 Identify vantage points (locations) to see and be seen as the signaler
6.3.5 Discuss rules for designating signalers and how to deal with infractions

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 6.4: **Exhibit public relation shills to address situations such as increasing internal and external customer/client satisfaction**

Key Indicators:

6.4.1 Develop and maintain customer relations
6.4.2 Apply relationship skills in a variety of situations
6.4.3 Define customer/client satisfaction
6.4.4 Evaluate customer/client satisfaction

Unit 7: Information Technology Applications

BIL: Essential

	12	AD	ApT
EDU:	P	P	P

Competency 7.1: Utilize communication technology

Key Indicators:

7.1.1 Communicate using electronic equipment (e.g., computer, fax, pagers, copier, internet, phone, print, etc.)
7.1.2 Access information using electronic equipment
7.1.3 Identify typical acceptable use policies regarding the use telecommunications tools

BIL: Essential

	12	AD	ApT
EDU:	I	P	I,P

Competency 7.2: Demonstrate computer literacy

Key Indicators:

7.2.1 Use writing/publications applications
7.2.2 Use spreadsheet applications
7.2.3 Use database applications
7.2.4 Apply presentation skills
7.2.5 Use a CAD system to perform drafting duties
7.2.6 Demonstrate awareness of computer terminology related to the construction profession (i.e., Global Positioning Systems, Geographic Information Systems, Electronic Surveying Equipment)
7.2.7 Demonstrate CADD communications and their limitations

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 7.3: **Recognize the impact of electronic literacy**

Key Indicators:

7.3.1 Create awareness of emerging electronic technology in construction

7.3.2 Identify various uses of technology in construction process (scheduling, bar coding, material management, equipment, and hardware)

7.3.3 Analyze the impact of technology use (e.g., distance learning, CD ROM use) for the construction industry

7.3.4 Implement individualized technology in upgrading skills

Unit 8: Construction Documentation

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 8.1: **Prepare various construction documentation**

Key Indicators:

8.1.1 Interpret change orders, including change documents (take-offs, estimating, plan development, plan approval)
8.1.2 Calculate billing
8.1.3 Confirm parts prices
8.1.4 Evaluate job costs
8.1.5 Understand building permit procedures
8.1.6 Understand components of Avoid Verbal Order, Request For Information, Addendums, etc.
8.1.7 Apply concepts of tolerances and equivalency applied to specifications
8.1.8 Understand various processes for effectiveness and efficiency

BIL: Essential

	12	AD	ApT
EDU:	I	P	I,P

Competency 8.2: **Apply fundamentals of construction documents, schematics, specifications, and construction drawings**

Key Indicators:

8.2.1 Recognize, identify, and interpret specifications
8.2.2 Identify established procedures for interpreting construction documents and diagrams
8.2.3 Interpret dimensions, symbols, types of lines, views, and scales
8.2.4 Make spatial interpretation of various three-dimensional forms for two-dimensional drawings
8.2.5 Apply algebraic procedures and geometric concepts to construction documents reading

8.2.6 Work within established industry tolerance parameters as defined by construction documents
8.2.7 Demonstrate knowledge of zoning, property lines, utilities, building line, setback, building corners, and elevation
8.2.8 Identify the need for the coordination of all trade documents

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 8.3: Understand safety documents

Key Indicators:
8.3.1 Identify forms required to document accidents
8.3.2 Complete accident reports in accordance with required standards
8.3.3 File reports with appropriate personnel
8.3.4 Understand the impact on workers' compensation, insurance bonding, and company standard operating procedure

Unit 9: Leadership and Teamwork

BIL: Essential

	12	AD	ApT
EDU:	P	P	P

Competency 9.1: **Explain the roles and responsibilities of the individual as part of the team**

Key Indicators:

9.1.1 Identify attitudes and behaviors that promote positive interaction between members of the work team

9.1.2 Identify the roles and responsibilities of the individual as a member of the work team

BIL: Essential

	12	AD	ApT
EDU:	P	P	P

Competency 9.2: **Perform responsibly as a team member**

Key Indicators:

9.2.1 Organize assignments

9.2.2 Complete assignments in timely and effective manner

9.2.3 Assist other members of the work team

9.2.4 Monitor and write a report on progress of the project

9.2.5 Evaluate completed project according to customer requirements

9.2.6 Discuss typical safety situations encountered where teamwork is essential

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 9.3: **Use mentoring skills to inspire others to achieve**

Key Indicators:
9.3.1 Use motivational techniques to enhance performance in others
9.3.2 Practice motivational techniques
9.3.3 Develop and use reward and incentive systems

BIL: Essential

	12	AD	ApT
EDU:	P	P	P

Competency 9.4: **Resolve conflicts with co-workers to maintain a smooth workflow**

Key Indicators:
9.4.1 Use conflict resolution skills
9.4.2 Work collaboratively and cooperatively
9.4.3 Give and receive criticism in a diplomatic and constructive manner
9.4.4 Use diplomatic and constructive statements and responses

Unit 10: Safety, Health, and Environment

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 10.1: **Survey state and federal local regulations concerning worker safety, health, and protection of the environment**

Key Indicators:

10.1.1 Identify purpose of Occupational Safety and Health Administration (OSHA) regulations
10.1.2 Identify purpose of Environmental Protection Agency (EPA) regulations
10.1.3 Identify purpose of Nuclear Regulatory Commission regulations
10.1.4 Identify purpose of Bureau of Workers Compensation (BWC) regulations

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 10.2: **Demonstrate practices that contribute to the creation of a hazard-free, accident-free environment**

Key Indicators:

10.2.1 Follow procedures established to prevent accidents
10.2.2 Understand Material Safety Data Sheets (MSDS) and other applicable regulatory guidelines
10.2.3 Identify the principles of ergonomics and body mechanics
10.2.4 Recognize symptoms of exposure to health-threatening environments (e.g., temperature, chemicals)
10.2.5 Understand the interactions of incompatible substances
10.2.6 Demonstrate accepted best safety practices (i.e., OSHA 10-, 30-hour coursework)
10.2.7 Select Personal Protective Equipment for given environment or situation

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 10.3: **Identify emergency response plans in a variety of industry settings**

Key Indicators:

10.3.1 Describe different types of plans
10.3.2 Identify procedures to be followed in the event of an emergency response
10.3.3 Demonstrate knowledge of hazard communications
10.3.4 Identify Personal Protective Equipment and response equipment/materials needed for emergency response

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 10.4: **Complete requirements for First Aid/CPR certification**

Key Indicators:

10.4.1 Obtain first-aid certification
10.4.2 Obtain cardiopulmonary resuscitation (CPR) certification
10.4.3 Obtain OSHA requirements for appropriate first aid equipment

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 10.5: Maintain safety on the job-site

Key Indicators:

10.5.1 Evaluate various activities and tasks and the appropriate access and egress devices, fire safety, and structural safety components

10.5.2 Discuss various accident conditions associated with egress and access on a typical construction site

10.5.3 Discuss various federal, state, and local safety regulations associated with access and egress

10.5.4 Discuss potential work surface problems found on many construction sites and identify appropriate remediation measures

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 10.6: Understand structural issues related to worker safety and health

Key Indicators:

10.6.1 Explain loads and contributing factors construction process impacting job safety

10.6.2 Explain excavation, trenching, and shoring designs (fire, material degrade, and national protection)

10.6.3 Explain temporary bracing

10.6.4 Explain planking

10.6.5 Explain tripping (single riser ¼, less 2 steps)

10.6.6 Explain scaffolding

10.6.7 Explain temporary structures

10.6.8 Explain temporary utilities

10.6.9 Determine the affects of hazardous utilities (welding)

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 10.7: **Use MSDS information to manage, use and Dispose of hazardous materials**

Key Indicators:

10.7.1 Obtain, understand and follow MSDS information

10.7.2 Use hazardous materials safely

Unit 11: Legal Aspects

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 11.1: **Perform duties according to regulations, policies, laws, legislated rights, and contract provisions**

Key Indicators:

11.1.1 Explain legal responsibilities limitations, and implications of actions
11.1.2 Comply with legal responsibilities specified by state practice act(s) and other pertinent legislation
11.1.3 Compare/contrast the roles of various regulatory agencies (content of laws and regulation of jurisdictions)
11.1.4 Demonstrate knowledge of contracts
11.1.5 Demonstrate knowledge regarding negligence and its consequences
11.1.6 Determine how work activities relate to health and safety issues
11.1.7 Describe design use issues (e.g., AIA Specification Divisions)

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 11.2: **Survey mandated standards**

Key Indicators:

11.2.1 Describe mandated standards for workplace safety, harassment, labor, and employment laws
11.2.2 Identify the consequences of non-compliance for employee and employer
11.2.3 Analyze the interrelationship between local and national codes
11.2.4 Identify legal responsibilities specified by state practice act(s) and other pertinent legislation as it relates to mandated reporting of different substance abuses
11.2.5 Identify legal responsibilities specified by state practice act(s) and other pertinent legislation and regulatory agencies as it relates to union and/or non-union practices

BIL: Essential

	12	AD	ApT
EDU:	1	P	P

Competency 11.3: Understand accessibility issues

Key Indicators:

11.3.1 Specify accommodation reasonable for employer and contractor

Unit 12: Ethics

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 12.1: **Differentiate between legal and ethical issues**

Key Indicators:
12.1.1 Define "legal"
12.1.2 Define "ethical"
12.1.3 Apply legal and ethical issues to the industry

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 12.2: **Practice responsibility within an ethical framework**

Key Indicators:
12.2.1 Identify codes of ethics within the professions
12.2.2 Develop an individual ethical framework
12.2.3 Demonstrate ethical behavior when interacting with colleagues both internal and external to the professions
12.2.4 Identify consequences of unethical conduct

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 12.3: ***Evaluate the implications of ethics***

Key Indicators:

12.3.1 Compare/contrast personal, professional, and organizational ethics

12.3.2 Demonstrate respect for property of customers, other trades (professions), and coworkers

12.3.3 Resolve issues relating to any potential conflicts of interest between personal and organizational ethics

12.3.4 Identify strategies for responding to the unethical actions of individuals and organizations

12.3.5 Identify the ramifications of unethical actions

Unit 13: Physical Aptitudes

BIL: Essential

	12	AD	ApT
EDU:	P	P	P

Competency 13.1: **Recognize the physical aptitudes necessary to perform critical work functions**

Key Indicators:

13.1.1 Demonstrate manual dexterity, balance, and eye-hand coordination

13.1.2 Discuss the various types of physical requirements needed by workers for performing various tasks

13.1.3 Compare different physical aptitudes necessary for different skilled trade areas

13.1.4 Differentiate between healthy and unhealthy behaviors

BIL: Essential

	12	AD	ApT
EDU:	P	P	P

Competency 13.2: **Demonstrate sufficient stamina to complete critical work functions (e.g., complete full shift, walking, carrying objects for extended periods)**

Key Indicators:

13.2.1 Demonstrate ways to conserve energy and strength in order to achieve stamina for entire work shifts

13.2.2 Identify safe practices that reduce wear and tear on muscles

13.2.3 Demonstrate exercises that can build strength for kind of work performed for various skilled trades

13.2.4 Discuss ways to pace activity on the job to ensure maintenance of productivity

13.2.5 Define self-motivation and describe how it affects critical work functions

BIL: Essential

	12	AD	ApT
EDU:	P	P	P

Competency 13.3: **Evaluate the ergonomic factors associated with the construction industry**

Key Indicators:

13.3.1 Identify work associated with lifting, moving, and placing heavy objects and materials

13.3.2 Demonstrate appropriate body mechanics in lifting and moving heavy objects

13.3.3 Understand the importance of properly operating various types of equipment and using various tools

Unit 14: Problem Solving and Critical Thinking

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 14.1: **Identify the relationship between available resources and requirements of a project/problem to accomplish realistic planning**

Key Indicators:

14.1.1 Use available resources/materials effectively to complete project or resolve a problem
14.1.2 Evaluate waste of resources/materials
14.1.3 Evaluate necessity for additional resources/materials
14.1.4 Determine alternative solutions for a specific project/problem
14.1.5 Evaluate feasibility of alternative suggestions
14.1.6 Implement appropriate alternatives

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 14.2: **Evaluate and adjust plans/schedules to respond to unexpected events and conditions**

Key Indicators:

14.2.1 Incorporate potential job disruptions into planning time lines
14.2.2 Identify potential events and conditions that disrupt the completion of a job
14.2.3 Solve situational problems involved with unexpected events and conditions
14.2.4 Adjust plans and schedules to reflect an unexpected change
14.2.5 Identify and assess critical situations and implement appropriate response
14.2.6 Provide a project update to track changes

Unit 15: Tools and Equipment

BIL: Essential

	12	AD	ApT
EDU:	P	P	P

Competency 15.1: **Identify the hand and power tools appropriate to the work site**

Key Indicators:

15.1.1 Identify by name and illustration the various types of hand and power tools applicable to the specified construction profession

15.1.2 Demonstrate the optimal use and safety considerations involved with various types of hand and power tools

BIL: Essential

	12	AD	ApT
EDU:	P	P	P

Competency 15.2: **Demonstrate appropriate use of tools to complete work functions**

Key Indicators:

15.2.1 Identify potential hazards related to the use of tools

15.2.2 Demonstrate safety procedures established for the use of tools

15.2.3 Demonstrate established procedures for lifting and carrying large or heavy objects

15.2.4 Follow established procedures for setup, operation, and maintenance of various types of tools specific to the identified construction profession

15.2.5 Operate tools and equipment in accordance with established operating procedures and safety standards

15.2.6 Demonstrate proper power attachment procedures

BIL: Essential

	12	AD	ApT
EDU:	P	P	P

Competency 15.3: Maintain hand and power tools appropriate to the work site

Key Indicators:

15.3.1 Perform preventive maintenance in accordance with guidelines specified by manufacturer and/or outside authorities with jurisdiction (e.g., OSHA inspectors, inspectors)

15.3.2 Conduct routine inspections of hand tools and power equipment

15.3.3 Troubleshoot maintenance problems in accordance with established procedures

15.3.4 Identify awareness of certification for operating specific tools

BIL: Essential

	12	AD	ApT
EDU:	P	P	P

Competency 15.4: Use appropriate personal protective equipment (PPE)

Key Indicators:

15.4.1 Identify the appropriate personal protective equipment (PPE) to wear with specific construction tasks and specific to the identified construction trade

15.4.2 Discuss various conditions that workers encounter and match appropriate personal protective equipment to each situation

15.4.3 Demonstrate and practice correct fit, use of each type, and care of personal protective equipment (PPE)

Apprenticeship Essential Competencies

Definition: *Preparation for careers that involve manual, mechanical, and technical skills and knowledge obtained through related instruction and on-the-job training (OJT)*

Occupational titles: Apprentice, Journeyperson, Crew Foreman, General Forman, Steward. Supervisor is a person held responsible by all parties for the outcome of the project.

The following occupations are covered in Unit 18:

- Carpentry trades
- Electrical trades
- Heating, Ventilating and Air-Conditioning (HVAC)
- Plumbing and Pipefitting
- Masonry
- Concrete trades
- Steel trades
- Heavy equipment operations

All apprenticeable trades require supplemental resources. Meeting the requirements of the apprenticeship will result in journeyperson status or other recognized credential.

Units 1-15	+	**Units 16-18**

Unit 16: Apprenticeship Essential Competencies

Skilled Trade Careers

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 16.1: **Understand the role and components of apprenticeships in the construction industry**

Key Indicators:

16.1.1 Define apprentice
16.1.2. Define apprenticeship
16.1.3 Identify apprenticeable occupations
16.1.4 Define journeyperson
16.1.5 Define indentured
16.1.6 Compare registered and non-registered apprenticeships
16.1.7 Explain the combination of related instruction and On-Job-Training in an apprenticeship pathway

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 16.2: **Identify the apprenticeship best suited to career goal**

Key Indicators:

16.2.1 Survey different apprenticeship programs through research, community service, field trips, shadowing, etc.
16.2.2 Compare work process schedules
16.2.3 Identify working conditions appropriate to apprenticeship area
16.2.4 Determine apprenticeship program requirements
16.2.5 Develop timeline for application process
16.2.6 Research labor market information and employment opportunities for selected apprenticeship programs

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 16.3: **Develop an understanding of the rights and responsibilities of participants in an apprenticeship program**

Key Indicators:

16.3.1 Understand the principals of Equal Employment Opportunity (EEO) regulations

16.3.2 Differentiate job descriptions and duties between various apprenticeship programs

16.3.3 Explain the advantages and disadvantages of specific apprenticeships

16.3.4 Determine the career ladder requirements for identified apprenticeships

16.3.5 Understand the employment issues associated with specific apprenticeships (benefits, pay range, loss of work, etc.)

16.3.6 Understand the need to enroll and complete an apprenticeship program

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 16.4: **Attain the skills required to perform the duties associated with a specific apprenticeship discipline**

Key Indicators:

16.4.1 Demonstrate technical skills associated with designated apprenticeship programs

Unit 17: Construction Cluster Essential Competencies

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 17.1: **Recognize universal signs and symbols to apply to given workplace situations**

Key Indicators:
17.1.1 Explain functions of signs and symbols
17.1.2 Work safely using signs and symbols
17.1.3 Inspect all signs and symbols for safe and proper use
17.1.4 Use proper signs and signals for the work area
17.1.5 Respond appropriately to signs and signals

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 17.2: **Examine building systems needed to complete a construction project**

Key Indicators:
17.2.1 List all building systems involved in a project
17.2.2 Describe the purpose of each system

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 17.3: **Identify components of building systems needed to complete a construction project**

Key Indicators:
17.3.1 List all components of the involved building system
17.3.2 Describe the function of each component

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 17.4: **Incorporate appropriate building systems Into a construction project**

Key Indicators:
17.4.1 Use appropriate components for the building systems required

Unit 18: Construction Cluster Applications

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 18.1: Demonstrate technical knowledge of carpentry trades

Key Indicators:
18.1.1 Perform technical skills specific to the trade
18.1.2 Identify materials necessary to complete tasks in trade
18.1.3 Use tools and equipment necessary in the trade
18.1.4 Apply safety practices appropriate to the trade
18.1.5 Identify codes and regulations acceptable in the trade
18.1.6 Understand the relationship of the given trade within the building process
18.1.7 Integrate math and science components associated with the trade
18.1.8 Identify construction documents specific to the trade
18.1.9 Identify the certification and accreditation within the trade

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 18.2: Demonstrate technical knowledge of electrical trades

Key Indicators:
18.2.1 Perform technical skills specific to the trade
18.2.2 Apply safety practices appropriate to the trade
18.2.3 Identify materials necessary to complete tasks in trade
18.2.4 Use tools and equipment necessary in the trade
18.2.5 Identify codes and regulations acceptable in the trade
18.2.6 Understand the relationship of the given trade within the building process
18.2.7 Integrate math and science components associated with the trade
18.2.8 Identify construction documents specific to the trade
18.2.9 Identify the certification and accreditation within the trade

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 18.3: **Demonstrate technical knowledge of HVAC technicians**

Key Indicators:
18.3.1 Perform technical skills specific to the trade
18.3.2 Apply safety practices appropriate to the trade
18.3.3 Identify materials necessary to complete tasks in trade
18.3.4 Use tools and equipment necessary in the trade
18.3.5 Identify codes and regulations acceptable in the trade
18.3.6 Understand the relationship of the given trade within the building process
18.3.7 Integrate math and science components associated with the trade
18.3.8 Identify construction documents specific to the trade
18.3.9 Identify the certification and accreditation within the trade

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 18.4: **Demonstrate technical knowledge of plumbing and pipefitting trades**

Key Indicators:
18.4.1 Perform technical skills specific to the trade
18.4.2 Apply safety practices appropriate to the trade
18.4.3 Identify materials necessary to complete tasks in trade
18.4.4 Use tools and equipment necessary in the trade
18.4.5 Identify codes and regulations acceptable in the trade
18.4.6 Understand the relationship of the given trade within the building process
18.4.7 Integrate math and science components associated with the trade
18.4.8 Identify construction documents specific to the trade
18.4.9 Identify the certification and accreditation

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 18.5: Demonstrate technical knowledge of masonry

Key Indicators:

18.5.1 Perform technical skills specific to the trade
18.5.2 Apply safety practices appropriate to the trade
18.5.3 Identify materials necessary to complete tasks in trade
18.5.4 Use tools and equipment necessary in the trade
18.5.5 Identify codes and regulations acceptable in the trade
18.5.6 Understand the relationship of the given trade within the building process
18.5.7 Integrate math and science components associated with the trade
18.5.8 Identify construction documents specific to the trade
18.5.9 Identify the certification and accreditation within the trade

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 18.6: Demonstrate technical knowledge of the concrete trades

Key Indicators:

18.6.1 Perform technical skills specific to the trade
18.6.2 Apply safety practices appropriate to the trade
18.6.3 Identify materials necessary to complete tasks in trade
18.6.4 Use tools and equipment necessary in the trade
18.6.5 Identify codes and regulations acceptable in the trade
18.6.6 Understand the relationship of the given trade within the building process
18.6.7 Integrate math and science components associated with the trade
18.6.8 Identify construction documents specific to the trade
18.6.9 Identify the certification and accreditation within the trade

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 18.7: **Demonstrate technical knowledge of steel trades**

Key Indicators:
18.7.1 Perform technical skills specific to the trade
18.7.2 Apply safety practices appropriate to the trade
18.7.3 Identify materials necessary to complete tasks in trade
18.7.4 Use tools and equipment necessary in the trade
18.7.5 Identify codes and regulations acceptable in the trade
18.7.6 Understand the relationship of the given trade within the building process
18.7.7 Integrate math and science components associated with the trade
18.7.8 Identify construction documents specific to the trade
18.7.9 Identify the certification and accreditation within the trade

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 18.8: **Demonstrate technical knowledge of heavy equipment operations**

Key Indicators:
18.8.1 Perform technical skills specific to the trade
18.8.2 Apply safety practices appropriate to the trade
18.8.3 Identify materials necessary to complete tasks in trade
18.8.4 Use tools and equipment necessary in the trade
18.8.5 Identify codes and regulations acceptable in the trade
18.8.6 Understand the relationship of the given trade within the building process
18.8.7 Integrate math and science components associated with the trade
18.8.8 Identify construction documents specific to the trade
18.8.9 Identify the certification and accreditation within the trade

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 18.9: **Demonstrate the basic knowledge of other apprenticeable occupations**

Key Indicators:

18.9.1 Perform technical skills specific to the trade
18.9.2 Apply safety practices appropriate to the trade
18.9.3 Identify materials necessary to complete tasks in trade
18.9.4 Identify tools and equipment necessary in the trade
18.9.5 Identify codes and regulations acceptable in the trade
18.9.6 Understand the relationship of the given trade within the building process
18.9.7 Integrate math and science components associated with the trade
18.9.8 Identify construction documents specific to the trade
18.9.9 Identify the certification and credential within the trade

Unit 19: Design-Build Cluster Essential Competencies

Definition: *Preparation for careers in designing, planning, managing, building and maintaining the design-build environment.*

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 19.1: **Employ methods of data collection and analysis to provide information for projects**

Key Indicators:

19.1.1 Access research methods available to formulate project planning and problem-solving
19.1.2 Provide appropriate precedents for development of a project
19.1.3 Articulate logical rationale for use of chosen precedents

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 19.2: **Work with potential clients**

Key Indicators:

19.2.1 Give a speech to explain a concept
19.2.2 Show project plans for visual impact
19.2.3 Evaluate customer comprehension
19.2.4 Facilitate a variety of clients and agencies
19.2.5 Identify types of client/agency needs
19.2.6 Mediate diversity to meet needs

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 19.3: **Integrate structural systems, environmental systems, safety systems, building envelope systems and building service systems to design modern buildings**

Key Indicators:

19.3.1 Assess building systems and their interrelationships to develop design criteria

19.3.2 Select and integrate building systems

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 19.4: **Review traditional project phases and various roles within them to plan for and implement phases within a project**

Key Indicators:

19.4.1 Relate traditional project phases and the various roles within them to a current project

19.4.2 Work through project phases

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 19.5: **Apply the basic principles of environmental impact to enhance project acceptance and quality**

Key Indicators:
19.5.1 Evaluate and align sustainable design elements to add value to the project
19.5.2 Integrate sustainable elements into project designs

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 19.6: **Apply design requirements to accommodate people with varying physical abilities**

Key Indicators:
19.6.1 Study the Americans with Disabilities Act (ADA) in order to build compliance into project designs
19.6.2 Integrate ADA compliance into project designs

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 19.7: **Appreciate the diversity of needs, values and social patterns in project design**

Key Indicators:
19.7.1 Identify Western, non-Western, national and regional traditions and heritage to express diversity in project design as required
19.7.2 Apply cultural traditions and diversity to project design

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 19.8: **Use architect's plan, manufacturer's illustrations and other materials to visualize proposed work and to transfer specific data**

Key Indicators:

19.8.1 Sketch/draw/illustrate concepts and ideas
19.8.2 Draw or sketch plan/layout to be completed
19.8.3 Use proper measurements to determine layout

Unit 20: Design-Build Cluster Technical Competencies

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 20.1: **Use drawings and computer-generated plans to develop a technical set of drawings**

Key Indicators:

20.1.1 Identify client's needs and wants to develop criteria for a set of technical drawings

20.1.2 Develop a set of technical drawings meeting the client's specifications

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 20.2: **Employ appropriate representational media to convey essential formal elements**

Key Indicators:

20.2.1 Use two- and three-dimensional drawings to convey graphic information

20.2.2 Employ basic drawing skills

20.2.3 Show three-dimensions in a two-dimensional drawing

20.2.4 Reference drawings and sketches to build models

20.2.5 Employ basic model building techniques

20.2.6 Verify accuracy of model based on drawings and sketches used

20.2.7 Employ computer modeling techniques to convey graphic information

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 20.3: **Study principles, conventions, standards, applications and restrictions pertaining to the manufacture and use of construction materials, components and assemblies to incorporate into project design**

Key Indicators:

20.3.1 Evaluate and select building materials and assemblies to meet project specifications

20.3.2 Develop and communicate an assigned building assembly

20.3.3 Use appropriate combinations of building materials and components to satisfy the requirements of building programs

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 20.4: **Apply basic organizational, spatial, structural and constructional principles to the design of interior and exterior space**

Key Indicators:

20.4.1 Develop design alternatives to address a given problem

20.4.2 Evaluate and select the most appropriate solution

Unit 21: Design-Build Architecture Cluster Competencies

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 21.1: Draw floor plan from preliminary sketch

Key Indicators:
21.1.1 Draw floor plan(s) to appropriate scale
21.1.2 Dimension plan with annotations
21.1.3 Prepare door, window schedules
21.1.4 Identify need for building codes and references

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 21.2: Draw foundation plan

Key Indicators:
21.2.1 Draw foundation plan(s) to appropriate scale
21.2.2 Dimension plans with appropriate annotation (i.e., footing size, floor framing)

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 21.3: Draw elevations

Key Indicators:
21.3.1 Draw all areas of exterior elevations
21.3.2 Dimension elevation drawings
21.3.3 Note various materials by name

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 21.4: Draw sections and details

Key Indicators:
21.4.1 Determine drawing scale
21.4.2 Draw typical wall section
21.4.3 Draw longitudinal and/or cross section
21.4.4 Draw stairway section
21.4.5 Draw typical cabinet elevations

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 21.5: Draw electrical, plumbing, and HVAC plans

Key Indicators:
21.5.1 Draw electrical plan locating receptacle, switch, and lighting outlets
21.5.2 Draw plumbing plan showing drain vent system
21.5.3 Draw isometric drawings of building draw/vent system

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 21.6: Interpret Site Plan

Key Indicators:

21.6.1 Identify topographical and existing features of areas (i.e., property lines, utilities, streets)
21.6.2 Identify parcel map
21.6.3 Identify existing land survey plat

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 21.7: Design a residential structure

Key Indicators:

21.7.1 Construct a floor plan with appropriate adjacencies, traffic patterns, orientation of spaces and views
21.7.2 Construct a foundation plan
21.7.3 Construct elevations
21.7.4 Construct wall section and detail
21.7.5 Construct roof plan
21.7.6 Determine contextual appropriateness
21.7.7 Determine energy responsiveness of structure (i.e., code mandates, energy usage, glass, insulation)
21.7.8 Incorporate appropriate use of public spaces
21.7.9 Present rendering using 3-D prototypes

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 21.8: Design a commercial structure

Key Indicators:

21.8.1 Construct a floor plan with appropriate adjacencies, traffic patterns, orientation of spaces and views
21.8.2 Construct a foundation plan
21.8.3 Construct elevations
21.8.4 Construct wall section and detail
21.8.5 Construct roof plan
21.8.6 Determine contextual appropriateness
21.8.7 Determine energy responsiveness of structure (i.e., code mandates, energy usage, glass, insulation)
21.8.8 Incorporate appropriate use of public spaces
21.8.9 Incorporate cultural aesthetics
21.8.10 Present rendering using 3-D prototypes

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 21.9: Construct electrical drawings

Key Indicators:

21.9.1 Identify components and symbols
21.9.2 Identify connections
21.9.3 Draw components according to engineer's sketch
21.9.4 Draw a wiring schematic

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 21.10: Construct electronic drawings

Key Indicators:
21.10.1 Identify components and symbols
21.10.1 Identify connections
21.10.2 Draw components according to engineer's sketch
21.10.3 Draw a schematic

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 21.11: Apply technical skills to restoration of existing structures

Key Indicators:
21.11.1 Evaluate restoration problems to plan solutions
21.11.2 Determine materials required to complete restoration
21.11.3 Match materials selected to the restoration specifications
21.11.4 Implement restoration strategies to produce restored structure
21.11.5 Restore structure to match original structure within specifications

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 21.12: **Evaluate the work required to repair existing structures**

Key Indicators:

21.12.1 Use evaluation strategies to assess the extent and condition of any problems

21.12.2 Identify potential sources of problems

21.12.3 Select the most probable cause of each problem

21.12.4 Identify tools, materials and human resources needed to complete the repair work effectively and efficiently

21.12.5 Complete the repair work to restore project to the original condition

Unit 22: Design-Build Urban Planning Cluster

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 22.1: Examine the concepts of urban planning

Key Indicators:

22.1.1 Identify the challenges of an urbanized world
22.1.2 Identify components necessary to managing municipal functions
22.1.3 Determine the roles of city governments
22.1.4 Examine problems of mass movement and spatial reorganization generated by expanding populations
22.1.5 Determine the attraction of urban life
22.1.6 Explain why 21st century is the first truly urban era

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 22.2: Examine the issues of urban planning

Key Indicators:

22.2.1 Apply appropriate implementation tools for orderly, efficient and equitable development and arrangement of land (i.e., zoning, development regulations, capital improvement programs)
22.2.2 Determine appropriate health and social programs to improve the standard of living for those lacking in resources and/or opportunities
22.2.3 Understand the preservation of historic buildings, neighborhoods and sites to implement a cultural appreciation of architecture and geographic heritage through the protection of the physical representations of that heritage
22.2.4 Examine the coordination of the transportation network of the community with its broader goals and objectives
22.2.5 Analyze housing problems and opportunities
22.2.6 Understand the development of policies as part of the planning process

22.2.7 Identify economic development resources for attraction and retention of industries
22.2.8 Integrate environmental values (preservation of wetlands, air quality strategies, protection of natural areas) into land use and other community plans
22.2.9 Merge the aesthetics of the physical design of urban areas with urban policy making
22.2.10 Examine the strategies for regional and national development (i.e., modernization and urbanization, transportation, rural development patterns, sustainable development, and related strategies of economic development

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 22.3: **Use various technical tools to study issues of urban growth, development and management**

Key Indicators:
22.3.1 Use computerized map overlays
22.3.2 Use computerize imaging
22.3.3 Use graphic analysis
22.3.4 Use statistics
22.3.5 Use survey research

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 22.4: Participate in community meetings

Key Indicators:

22.4.1 Lead/facilitate a community meeting

22.4.2 Mediate between a wide variety of citizens concerned about controversial issues

22.4.3 Work effectively with specialists such as developers and traffic engineers

Construction Management Cluster Competencies

Definition: *Preparation for careers in construction management/supervision. Trained supervisors who put into operation of labor and management to ensure quality, productivity, and profitability. Work experience and/or advanced degree*

Occupational titles: Superintendent, Crew Foreman, General Foreman, Steward. Supervisor is person held responsible by all parties for the outcome of the project, whether successful or not.

Responsibilities and characteristics:

- Deal with changing workplace, while performing duties successfully
- Directs and coordinates assets that have the opportunity to dramatically affect productivity and quality
- Effective leader
- Resourceful efficient planner
- Accurate record keeper
- Source of technical know-how
- Excellent communicator and problem solver
- Decision maker
- Safety advocate
- Effective in conflict management

Unit 23: Site Development

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 23.1: Establish and maintain line and grade

Key Indicators:

23.1.1 Describe worker's role in maintaining and establishing the design location/elevation
23.1.2 Describe the steps used in identifying the actual location/elevation
23.1.3 Describe the steps used to deduce the variance from the design location/elevation
23.1.4 Identify best possible method to communicate the relation between design and actual location/elevation to other workers
23.1.5 Use lasers/levels/transits to check alignment and elevations
23.1.6 Grade and compact fill materials
23.1.7 Understand appropriate use of soil types

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 23.2: Perform excavation to specifications

Key Indicators:

23.2.1 Discuss different types of excavation situations
23.2.2 Demonstrate excavation specifications in sets of prints and in building code
23.2.3 Identify project's performance within allowable industry tolerances
23.2.4 Demonstrate how to monitor progress of excavation activities
23.2.5 Use hand signals used in various excavation activities
23.2.6 Identify specific safety hazards and be aware of them while performing excavation tasks

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 23.3: Identify Work Site Environmental and Accident Hazards

Key Indicators:

23.3.1 Explain various hazards associated with all types of site development

23.3.2 Identify safety procedures available to the worker associated with various hazards

23.3.3 Identify early warning signs associated with various hazard

23.3.4 Create an awareness of legal issues in the field

Unit 24: Managing the Role of the Supervisor

BIL: Essential

	12	AD	ApT
EDU:	I	P	P

Competency 24.1: **Analyze the role of the supervisor on a construction project**

Key Indicators:

24.1.1 Understand the supervisory role as it relates to the interests of the contractor, the workers, and the project owner

24.1.2 Identify decision-making that influences the overall outcome of the project (generates profit/loss, completed on time, standard of quality of work performed)

24.1.3 Interpret company policy

24.1.4 Make decisions on behalf of the contractor

24.1.5 Complete work within the bounds established by the project contract, collective bargaining agreements, and according to policy of employer

BIL: Essential

	12	AD	ApT
EDU:	I	I,P	I,P

Competency 24.2: **Enable skilled workers to perform job effectively and efficiently**

Key Indicators:

24.2.1 Determine necessary crew size

24.2.2 Order necessary equipment and supplies

24.2.3 Coordinate various work assignments

24.2.4 Monitor progress of various crafts on the work site

24.2.5 Adjusts work schedules to meet the requirements associated with factors such as weather, time, skill levels, etc.

BIL: Essential

	12	AD	ApT
EDU:	I	I,P	I,P

Competency 24.3: Demonstrates conflict resolution skills

Key Indicators:

24.3.1 Act in accordance with workers' rights and responsibilities
24.3.2 Understand positions and perspectives of various parties with whom they interact
24.3.3 Identify solutions to issues that benefits all parties

BIL: Essential

	12	AD	ApT
EDU:	I	I,P	I,P

Competency 24.4: Apply knowledge and uses of basic construction materials

Key Indicators:

24.4.1 Identify and describe variety of construction materials for which workers may be responsible on site
24.4.2 Identify specific handling and storage characteristics of different materials
24.4.3 Discuss appropriate transport methods of various construction materials
24.4.4 Identify incompatible materials
24.4.5 Identify fastening or joining applications characteristic to different materials

Unit 25: Planning and Coordination

BIL: Essential

	12	AD	ApT
EDU:	I	I,P	I,P

Competency 25.1: **Create work sequences for tasks and units of work**

Key Indicators:

25.1.1 Discuss the sequences of activities on a typical construction project
25.1.2 Develop a timeline for sequencing the activities for an entire project based on units of work
25.1.3 Discuss the impact of adequate and inadequate project planning
25.1.4 Discuss logical sequences for different types of projects with different space limitations

BIL: Essential

	12	AD	ApT
EDU:	I	I,P	I,P

Competency 25.2: **Analyze delivery and use of materials and equipment to maximize productivity and safety**

Key Indicators:

25.2.1 Discuss delivery of materials and equipment and their effects on employer cash flow and construction economics
25.2.2 Determine materials and equipment storage on various types of job sites
25.2.3 Demonstrate scheduling and delivering procedures with various vendors
25.2.4 Explain adjustments to special issues related to project start-up and close-out

BIL: Essential

	12	AD	ApT
EDU:	I	I,P	I,P

Competency 25.3: Create work assignments for crew and individuals

Key Indicators:

25.3.1 Determine what constitutes "units of work" and its role in construction economics

25.3.2 Discuss typical tasks, needed skills, and tasks assignments

25.3.3 Examine apprenticeship roles and rotations and how they relate to work and crew assignments

25.3.4 Develop a plan of how to monitor progress and quality

BIL: Essential

	12	AD	ApT
EDU:	I	I,P	I,P

Competency 25.4: Envision how work and materials fit together to produce a complete job

Key Indicators:

25.4.1 Describe a completed product from drawings

25.4.2 Summarize the entire project to a crew

25.4.3 Plan work processes including matching material amounts and types of work to be done

BIL: Essential

	12	AD	ApT
EDU:	I	I,P	I,P

Competency 25.5: Determine personnel needs

Key Indicators:

25.5.1 Coordinate and negotiate work of trades
25.5.2 Develop job assignment
25.5.3 Determine necessary crew size and adjust to conditions
25.5.4 Coordinate personnel and equipment in a timely fashion
25.5.5 Adjust to special issues or needs of architects, owners engineers, or the public

Unit 26: Supervisory Relationships with Workers

BIL: Essential

	12	AD	ApT
EDU:	I	I,P	I,P

Competency 26.1: **Conduct worker orientation and employee development**

Key Indicators:

26.1.1 Explain work procedures including tool and equipment use
26.1.2 Conduct job site safety meetings
26.1.3 Monitor, coach, correct, and reinforce on-the-job performance
26.1.4 Exhibit patience when working with apprentices
26.1.5 Model good safety practices
26.1.6 Conduct performance evaluations
26.1.7 Explain jobsite chain of command

BIL: Essential

	12	AD	ApT
EDU:	I	I,P	I,P

Competency 26.2: **Promote cooperation and teamwork**

Key Indicators:

26.2.1 Resolve conflict successfully and productively
26.2.2 Attend to specific issues related to jobsite diversity
26.2.3 Enforce alcohol and drug policies
26.2.4 Explain purpose of specific tasks and the relationship to entire project
26.2.5 Communicate clear directions to workers
26.2.6 Conduct site meetings of various types
26.2.7 Negotiate win-win solutions
26.2.8 Maintain safety throughout the jobsite

APPENDICES

APPENDIX A

CONSTRUCTION TECHNOLOGIES PROFILE REVIEW PANEL PARTICIPANTS

Mr. Dan Baechlin, Workforce Strategies, OBES; Program Developer, ODJFS

Ms. Marcia C. Belcher, Program Director, University of Akron

Mr. Jim Carr, Technology Coordinator, Construction, OSU/ATI

Ms. Mary Ann Dayspring, State Director, U.S. Department of Labor, Bureau of Apprenticeship and Training

Mr. Tim Dean, Electricity Instructor, Madison High School

Mr. Bob Feathers, Department Head, HVAC/R, RETS Tech Center

Mr. Dale Frost, Miami Valley CTC

Mr. Hank Gladney, Manager, Industrial Relations, Clark State

Ms. Jill Harris, Coordinator, Training & Education, Corna-Kokosing Construction Company

Mr. Michael Hassell, Instruction Coordinator, International Brotherhood of Electrical Workers/Columbus Joint Apprenticeship and Training Committee for the Electrical Industry (IBEW/JATC)

Mr. Daniel L Keiser, Principal, Keiser Design Group Inc.

Mr. Werner C. Loehlein, Chief, Water Management Section, U.S. Army Corps of Engineers

Mr. J. Brent Patterson, Manager, Career Enrichment Institute Apprenticeship Program, Ohio University

Mr. Ed Radigan, Development Manager, PROTECS

Mr. Greg Sizemore, Executive Director, Construction Owners Association of Tri-States Inc.; Executive Director, Construction Workforce Development Center (CWDC)

Mr. Jan Sokolnicki, Ohio Board of Building Standards

Mr. Eugene W Stepanik, Training Director, Cleveland Electrical Joint Apprenticeship and Training Committee

Mr. Albert C Wahle, P.E., P.S., Professor/Chairperson, Architectural/Civil Engineering/ Industrial Design, Sinclair Community College

Mr. John H. Zeit, Associate Professor, Stark State College of Technology

APPENDIX B

PATHWAY TEMPLATE

(High School)

(Career Center)

(Community College)

Tech Prep Program

(School Year)

9th GRADE	CREDIT	10th GRADE	CREDIT	11th GRADE	CREDIT	12th GRADE	CREDIT

Recommended Prerequisites for Grade 11 of Tech Prep	Recommended for College Portion of Tech Prep

Junior Year Tech Center/College Technical Courses		Senior Year Tech Center/College Technical Courses	
*Technical Subjects	On-transcript _____ College Credits	*Technical Subjects	_____ College Credits

Articulated Credits: - _____ Community College

Revised 2/11/02

DEGREE: ASSOCIATE OF _____

_____ **-Tech Prep** _____
(Career Center) (Name of Tech Prep Program)

Term Taken	First Term	Pre-requisite	Co-requisite	Quarter Credit Hours	University Pathway Equivalent	Completed as Tech Prep Component
Term Taken	**Second Term**	**Pre-requisite**	**Co-requisite**			
Term Taken	**Third Term**	**Pre-requisite**	**Co-requisite**			

Revised 2/11/02

DEGREE: ASSOCIATE OF _____

_____ **-Tech Prep** _____
(Career Center) (Name of Tech Prep Program)

Term Taken	Fourth Term	Pre-requisite	Co-requisite	Quarter Credit Hours	University Pathway Equivalent	Completed as Tech Prep Component
Term Taken	**Fifth Term**	**Pre-requisite**	**Co-requisite**			
Term Taken	**Sixth Term**	**Pre-requisite**	**Co-requisite**	**Quarter Credit Hours**	**University Pathway Equivalent**	**Completed as Tech Prep Component**

90

Revised 2/11/02

_____ **Total Quarter Credit Hours**

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